PATENT ABSTRACTS OF JAPAN

(11)Publication number : 06-266309
(43)Date of publication of application : 22.09.1994

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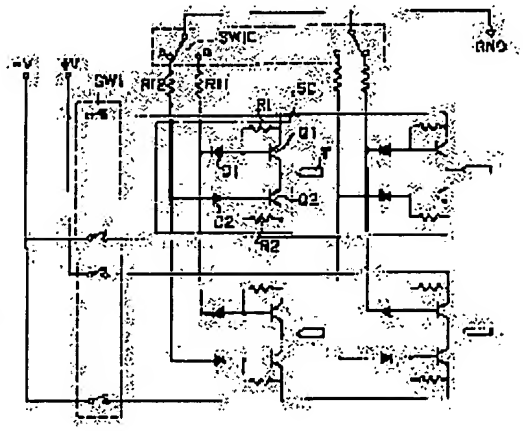
(71)Applicant : NIPPON MEKTRON LTD
(72)Inventor : TAKANO SHOJI
WAKIMOTO YUJI

(54) ELECTROPHORESIS MATRIX DISPLAY DEVICE

(57)Abstract:
PURPOSE: To provide the electrophoresis matrix display device which can make a crosstalk-free display by applying a voltage, element by element, according to display contents.
CONSTITUTION: The display device has an entire-surface electrode as one electrode and divided electrodes to which a voltage can be applied individually as the other electrodes and is provided with a couple of transistors(TR) Q1 and Q2 which have their emitters and collectors cascaded so that one end terminal is connected to a plus power source, the other end is connected to a minus power source, and an output terminal T is connected to between them and also have their bases connected to diodes D1 and D2 in series so that the conduction directions are different, TP by TR. Further, the device is equipped with a switching circuit SC which applies a plus and a minus voltage to one of the divided electrodes, a 1st switch SW1 which connect the plus and minus power sources to the emitters and collectors of the couple of TRs, and a 2nd switch SW10 which selectively grounds the base of one of the couple of TRs through the diode.



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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] In the electrophoresis matrix display equipment which displays by coming to allot the dispersed system for an electrophoresis display which contained the liquid phase dispersion medium and the particle in inter-electrode [of the lot which counters mutually], impressing electric field to inter-electrode [said], and producing the migration of said dispersion medium The display with which one electrode is a whole surface electrode, and, as for the electrode of said lot, was constituted as a division electrode with which the electrode of another side can impress an electrical potential difference according to an individual, An emitter-collector is cascaded, on the other hand, an edge is connected to a positive supply, an another side edge is connected to a negative supply, and an output terminal is connected in the middle of both transistors. And the switching circuit which has the transistor of the pair to which the series connection of the diode was carried out so that the flow directions may differ for every transistor in each base, and impresses a forward electrical potential difference or a negative electrical potential difference to one of said the division electrodes, Electrophoresis matrix display equipment which offered the 1st switch which connects a positive supply and a negative supply to the emitter-collector of the transistor of said pair, and the 2nd switch which grounds which the base of the transistor of said pair alternatively through said diode.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the configuration of the circuit which starts the equipment which performs a display action using an electrophoresis operation, especially impresses an electrical potential difference to an electrode for a display action.
[0002]
[Description of the Prior Art] An electrophoresis display displays the contents of a request by allotting the dispersed system for a display which made the white-pigments particle distribute for example, in a black liquid dispersion medium to inter-electrode [by which opposite arrangement of the lot was carried out], impressing the electric field according to the contents which should be rewritten to inter-electrode to it, and moving a lifting and a particle for an electrophoresis operation to it. In this case, the migration situation of a particle is decided by the electric field to impress, and a display is performed so that that situation may be observed through a transparent electrode.
[0003] A display performs rewriting of one element or a by [1 trains] display by contrast's arising, supplying a selection signal from the electrode group of one group between two electrode groups which counter, and supplying forward electric field or negative electric field as an information signal from the electrode group of the group of another side according to the field strength and the direction which are impressed.
[0004]
[Problem(s) to be Solved by the Invention] Although impression of electric field should just be performed by identifying the selected component and the component which is not chosen, an unnecessary electrical potential difference, i.e., the so-called cross talk electrical potential difference, may be impressed also to the component which is not chosen, and a display becomes indistinct.
[0005] This invention aims at offering the electrophoresis matrix display equipment which can perform the display which was made in consideration of the above-mentioned point, impresses an electrical potential difference for every element according to the contents of a display, and does not have a cross talk.
[0006]
[Means for Solving the Problem] By this invention, to inter-electrode [of the lot which counters mutually] for the above-mentioned purpose achievement In the electrophoresis matrix display equipment which displays by coming to allot the dispersed system for an electrophoresis display containing a liquid phase dispersion medium and a particle, impressing electric field to inter-electrode [said], and producing the migration of said dispersion medium The display with which one electrode is a whole surface electrode, and, as for the electrode of said lot, was constituted as a division electrode with which the electrode of another side can impress an electrical potential difference according to an individual, An emitter-collector is cascaded, on the other hand, an edge is connected to a positive supply, an another side edge is connected to a negative supply, and an output terminal is connected in the middle of both transistors. And the switching circuit which has the transistor of the pair to which the series connection of the diode was carried out so that the flow directions may differ for every transistor in each base, and impresses a forward electrical potential difference or a negative electrical potential difference to one of said the division electrodes, The electrophoresis matrix display equipment which offered the 1st switch which connects a positive supply and a negative supply to the emitter-collector of the transistor of said pair, and the 2nd switch which grounds which the base of the transistor of said pair alternatively through said diode is offered.

[0007]
[Function] Electric field are impressed between the whole surface electrode of a display, and each division electrode. As for each division electrode, an electrical potential difference is impressed through an output terminal from that as which it was chosen of the transistors of the pair of a switching circuit. Selection of a transistor is performed by turning ON only one side of the transistor of a pair according to a control signal. Since diode is formed in the path of this control signal, the transistor chosen according to the polarity of a control signal is decided.
[0008] Thus, a display is performed, when an electrical potential difference is impressed between a division electrode and a whole surface electrode with the selected transistor and the particle in the dispersion medium for a display performs a migration operation. And the division electrode corresponding to the transistor which an electrical potential difference is not impressed to the transistor which is not chosen, therefore is not chosen does not display.
[0009]
[Effect of the Invention] It can prevent that the so-called cross talk electrical potential difference is not impressed to the electrode besides a request, and this invention serves as an indistinct display since only the transistor connected with a desired division electrode was chosen as electrophoresis matrix equipment as mentioned above.
[0010]
[Example] Drawing 1 shows the configuration of the electrophoresis matrix display equipment which applies this invention. In this drawing, E1 is a whole surface electrode, and it connects with GND and it will be in a touch-down condition. E2 is the division electrode by which opposite arrangement was carried out at the whole surface electrode E1, and each division electrode is terminals T1 and T2 and T3, respectively. -- It connects with Tn. These terminals T1 and T2, T3 -- Tn is connected to forward or negative power-source +V or -V according to the contents of a display which a display should perform.
[0011] And as for the component in which the component with the terminal T1 by which the division electrode was connected to forward power-source +V has the terminal T2 connected to negative power-source-V to a particle approaching a division electrode side like illustration, a particle approaches a whole surface electrode side. A display is rewritable by moving this particle in an electrophoresis operation. Even if the rewritten display stops impression of an electrical potential difference, it maintains a display as it is.
[0012] Drawing 2 shows the circuit which performs electrical-potential-difference impression to four components for every division electrode in drawing 1 . A sign is attached and explained about one among four components in this drawing.
[0013] This circuit is constituted as a circuit which offered switching circuit SC with the terminals T1 and T2 of a component, and the terminal T connected to T3-- on each components. And forward and a negative electrical potential difference are supplied from two terminals connected to forward power-source +V and negative power-source-V, and this switching circuit SC is grounded by any of the terminals 1 and 2 connected to GND through a switch SW10 they are, performs circuit actuation, and produces an output for Terminal T. The switch SW10 is formed for each [in the display device matrix of a display] train of every, and change-over actuation is alternatively carried out.
[0014] Drawing 3 shows the internal configuration of switching circuit SC of drawing 2 to a detail. That is, it has two transistors Q1 and Q2 as a switching element. And diodes D1 and D2 are inserted in the base of each transistors Q1 and Q2.
[0015] a transistor Q1 -- a PNP transistor -- it is -- said -- Q2 is an NPN transistor, the series connection of these both is carried out, and they are connected through the switch SW1 between positive supply +V and negative power-source-V. The switch SW1 is formed for each [in the display device matrix of a display] line of every, and is opened and closed alternatively.
[0016] Moreover, Terminal T is connected in the middle of transistors Q1 and Q2. And resistance R1 is connected between the base of a transistor Q1, and an emitter, and resistance R2 is connected between the base of a transistor Q2, and an emitter. Furthermore, diode D1 is inserted in the direction to which diode D2 flows in the base of a transistor Q1, and base current flows in the base of a transistor Q2 again, respectively.
[0017] In this case, since the electric conduction formats of two transistors are PNP and NPN and are different, the sense [as opposed to a transistor in diode D1 and this D2] is connected on the contrary. Thereby, base

current can be passed only to one side of the transistor of a pair.
[0018] And each other end of diodes D1 and D2 is connected to two fixed-end children of a switch SW10 at each **, respectively. The change-over terminal of a switch SW10 is connected to GND.
[0019] In this circuit, where a switch SW1 is closed, if a switch SW10 is switched to stationary contacts A or B, transistors Q1 or Q2 will carry out a turn-on, and electric power will be supplied to Terminal T in the electrical potential difference of positive supply +V or negative power-source-V. Thereby, the contents of a display of a display are rewritten.
[0020] If a switch SW1 is opened, since the transistor connected to the switch concerned does not produce an electrical potential difference for Terminal T and the electrical potential difference for rewriting will not be impressed to a display, the contents of a display of a display do not change.
[0021] Since Terminal T is connected to the terminal T1 of a display, and T2 -- as mentioned above, a display performs a display action. When rewriting the contents of a display, a switch SW10 is switched.
[0022] In the circuit of drawing 3 , since it has the composition that it was attached to four components and every two two-element switch SW1SW(s)10 of every were formed in a line writing direction and each direction of a train, display rewriting in every element can be performed by change-over of every two switches of these.

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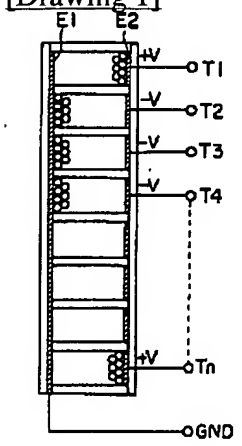
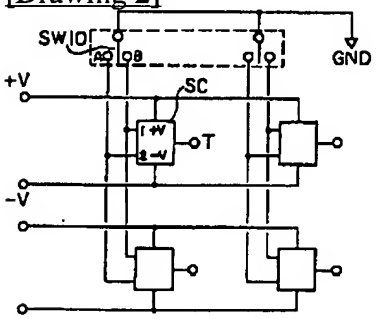
DRAWINGS

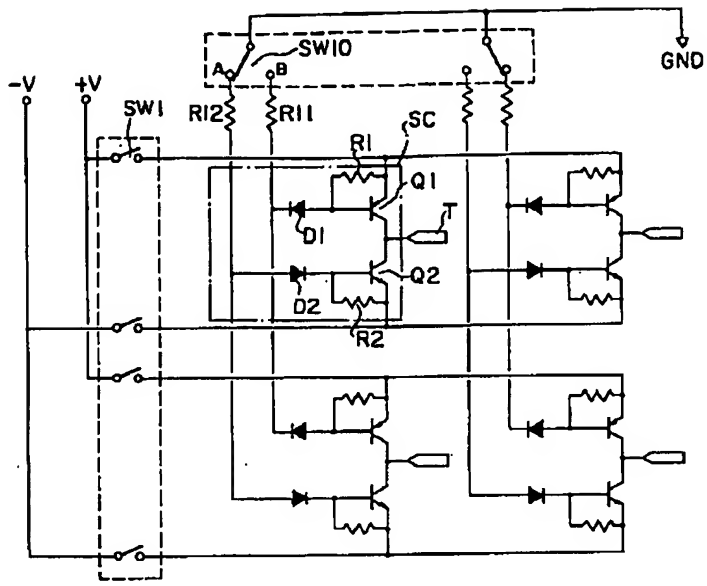
[Drawing 1]



[Drawing 2]



[Drawing 3]



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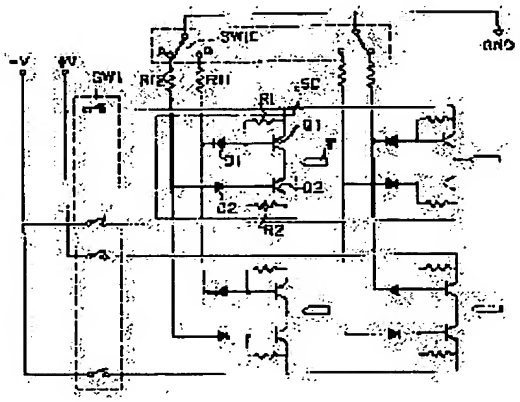

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Ｇ０９Ｇ　3/34		Ｃ　9176－5Ｇ		

審査請求　未請求　請求項の数１　ＯＬ　（全　４　頁）

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(22)出願日　平成５年(1993)３月15日

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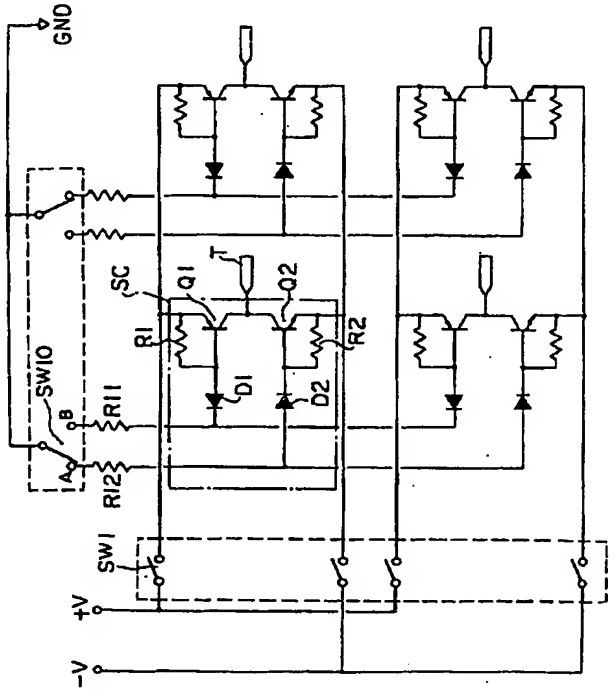
Epson

(54)【発明の名称】　電気泳動マトリクス表示装置

(57)【要約】　（修正有）

【目的】　表示内容に応じて１素子毎に電圧を印加してクロストークのない表示を行い得る電気泳動マトリクス表示装置を提供する。

【構成】　一方の電極が全面電極で、他方の電極が個別に電圧を印加できる分割電極として構成された表示装置で、エミッターコレクタが縦属接続されて一方端が正電源に、他方端が負電源に接続されてその中間に出力端子Ｔが接続され、各ベースにはトランジスタ毎に導通方向が異なるようにダイオードＤ１，Ｄ２が直列接続された一対のトランジスタＱ１，Ｑ２を有し、分割電極の一つに正、負の電圧を印加するスイッチング回路ＳＣと、一対のトランジスタのエミッターコレクタに正、負の電源を接続する第１のスイッチＳＷ１と、ダイオードを介して一対のトランジスタのいづれかのベースを選択的に接地する第２のスイッチＳＷ１０と、をそなえている。



【特許請求の範囲】

【請求項１】互いに対向する一組の電極間に、液相分散媒と粒子とを含んだ電気泳動表示用分散系が配されてなり、前記電極間に電界を印加して前記分散媒の泳動を生じさせることにより表示を行う電気泳動マトリクス表示装置において、

前記一組の電極は、一方の電極が全面電極で、他方の電極が個別に電圧を印加できる分割電極として構成された表示装置と、

エミッターコレクタが縦属接続されて一方端が正電源に、他方端が負電源に接続されて両トランジスタの中間に出力端子が接続され、かつ各ベースにはトランジスタ毎に導通方向が異なるようにダイオードが直列接続された一対のトランジスタを有し、前記分割電極の一つに正電圧または負電圧を印加するスイッチング回路と、

前記一対のトランジスタのエミッターコレクタに正電源および負電源を接続する第１のスイッチと、

前記ダイオードを介して前記一対のトランジスタのいづれかのベースを選択的に接地する第２のスイッチと、をそなえた電気泳動マトリクス表示装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は電気泳動作用を利用して表示動作を行う装置に係り、とくに表示動作のために電極に電圧を印加する回路の構成に関する。

【０００２】

【従来の技術】電気泳動表示装置は、一組の対向配置された電極間に、たとえば黒色液体分散媒中に白色顔料微粒子を分散せしめた表示用分散系を配し、電極間に書換すべき内容に応じた電界を印加して電気泳動作用を起こし、微粒子を移動させることにより所望内容の表示を行わせるものである。この場合、印加する電界により微粒子の移動状況が決まり、その状況を透明電極を通して観察するように表示が行われる。

【０００３】表示は、印加される電界の強さ、方向によってコントラストが生じるものであり、対向する２つの電極群のうち一方の組の電極群から選択信号を供給し、他方の組の電極群から正電界または負電界を情報信号として供給することにより１素子または１列づつ表示の書換を行う。

【０００４】

【発明が解決しようとする課題】電界の印加は、選択された素子と選択されていない素子とが識別されて行われればよいのであるが、選択されていない素子にも不要な電圧つまりいわゆるクロストーク電圧が印加されることがあり、表示が不鮮明になる。

【０００５】本発明は上述の点を考慮してなされたもので、表示内容に応じて１素子毎に電圧を印加してクロストークのない表示を行い得る電気泳動マトリクス表示装置を提供することを目的とする。

【０００６】

【課題を解決するための手段】上記目的達成のため、本発明では、互いに対向する一組の電極間に、液相分散媒と粒子とを含んだ電気泳動表示用分散系が配されてなり、前記電極間に電界を印加して前記分散媒の泳動を生じさせることにより表示を行う電気泳動マトリクス表示装置において、前記一組の電極は、一方の電極が全面電極で、他方の電極が個別に電圧を印加できる分割電極として構成された表示装置と、エミッターコレクタが縦属接続されて一方端が正電源に、他方端が負電源に接続されて両トランジスタの中間に出力端子が接続され、かつ各ベースにはトランジスタ毎に導通方向が異なるようにダイオードが直列接続された一対のトランジスタを有し、前記分割電極の一つに正電圧または負電圧を印加するスイッチング回路と、前記一対のトランジスタのエミッターコレクタに正電源および負電源を接続する第１のスイッチと、前記ダイオードを介して前記一対のトランジスタのいづれかのベースを選択的に接地する第２のスイッチと、をそなえた電気泳動マトリクス表示装置、を提供する。

【０００７】

【作用】表示装置の全面電極と各分割電極との間に、電界が印加される。各分割電極は、スイッチング回路の一対のトランジスタのうちの選択されたものから出力端子を介して電圧が印加される。トランジスタの選択は、制御信号に応じて一対のトランジスタの一方のみをオンにすることにより行われる。この制御信号の経路にダイオードが設けられているから、制御信号の極性に応じて選択されるトランジスタが決まる。

【０００８】このようにして選択されたトランジスタにより分割電極と全面電極との間に電圧が印加されて表示用分散媒における粒子が泳動作用を行うことにより表示が行われる。そして、選択されないトランジスタには電圧が印加されず、したがって選択されないトランジスタに対応する分割電極は表示を行わない。

【０００９】

【発明の効果】本発明は上述のように、電気泳動マトリクス装置に所望の分割電極につながるトランジスタのみを選択するようにしたため、いわゆるクロストーク電圧が所望外の電極に印加されることがなく、不鮮明な表示となることを防止できる。

【００１０】

【実施例】図１は、本発明を適用する電気泳動マトリクス表示装置の構成を示したものである。同図において、Ｅ１は全面電極であり、ＧＮＤに接続されて接地状態になる。Ｅ２は、全面電極Ｅ１に対向配置された分割電極であり、各分割電極はそれぞれ端子Ｔ１，Ｔ２，Ｔ３…Ｔｎに接続されている。これらの端子Ｔ１，Ｔ２，Ｔ３…Ｔｎは、表示装置が行うべき表示内容に応じて正または負の電源＋Ｖまたは－Ｖに接続される。

【００１１】そして正の電源＋Ｖに分割電極が接続された端子Ｔ１を持つ素子は、図示のように分割電極側に粒子が寄るのに対し、負の電源－Ｖに接続された端子Ｔ２を持つ素子は、全面電極側に粒子が寄る。この粒子を電気泳動作用で移動させることにより表示の書換を行うことができる。書き換えられた表示は、電圧の印加を停止してもそのままの表示を保つ。

【００１２】図２は、図１における各分割電極毎の４つの素子に対して電圧印加を行う回路を示したものである。同図における４つの素子のうち１つについて符号を付して説明する。

【００１３】この回路は、素子の端子Ｔ１，Ｔ２，Ｔ３…に接続される端子Ｔを持ったスイッチング回路ＳＣを各素子用にそなえた回路として構成されている。そして、このスイッチング回路ＳＣは、正の電源＋Ｖおよび負の電源－Ｖに接続される２つの端子から正、負の電圧が供給され、スイッチＳＷ１０を介してＧＮＤに接続される端子１、２のいづれかにより接地されて回路動作を行い、出力を端子Ｔに生じる。スイッチＳＷ１０は、表示装置の表示素子行列における各列毎に設けられており、選択的に切換操作される。

【００１４】図３は、図２のスイッチング回路ＳＣの内部構成を詳細に示したものである。すなわち、スイッチング要素として２つのトランジスタＱ１，Ｑ２を有する。そして各トランジスタＱ１，Ｑ２のベースにはダイオードＤ１，Ｄ２が挿入されている。

【００１５】トランジスタＱ１はＰＮＰトランジスタであり、同Ｑ２はＮＰＮトランジスタであり、これら両者が直列接続されて正電源＋Ｖおよび負の電源－Ｖとの間に、スイッチＳＷ１を介して接続されている。スイッチＳＷ１は、表示装置の表示素子行列における各行毎に設けられており、選択的に開閉される。

【００１６】またトランジスタＱ１，Ｑ２の中間には、端子Ｔが接続されている。そして、トランジスタＱ１のベース、エミッタ間に抵抗Ｒ１が、またトランジスタＱ２のベース、エミッタ間に抵抗Ｒ２が接続されている。さらに、トランジスタＱ１のベースにはダイオードＤ１が、またトランジスタＱ２のベースにはダイオードＤ２が、それぞれベース電流が流れる方向に挿入されている。

【００１７】この場合、２つのトランジスタの導電形式

が、ＰＮＰとＮＰＮであって相違するから、ダイオードＤ１と同Ｄ２とはトランジスタに対する向きが反対に接続されている。これにより、一対のトランジスタの一方のみにベース電流を流すことができる。

【００１８】そして、ダイオードＤ１およびＤ２の各他端は、それぞれスイッチＳＷ１０の２つの固定端子に各別に接続されている。スイッチＳＷ１０の切換端子はＧＮＤに接続されている。

【００１９】この回路において、スイッチＳＷ１を閉じた状態で、スイッチＳＷ１０を固定接点ＡまたはＢに切り換えると、トランジスタＱ１またはＱ２がターンオンして端子Ｔに正電源＋Ｖまたは負の電源－Ｖの電圧を給電する。これにより表示装置の表示内容が書き換えられる。

【００２０】スイッチＳＷ１を開けば、当該スイッチに接続されたトランジスタは、端子Ｔに電圧を生じないから表示装置には、書換のための電圧が印加されないから、表示装置の表示内容は変化しない。

【００２１】端子Ｔは、上述のように表示装置の端子Ｔ１，Ｔ２…に接続されるから表示装置が表示動作を行う。表示内容の書換を行う場合は、スイッチＳＷ１０を切り換える。

【００２２】図３の回路では、４つの素子に付き行方向および列方向それぞれに２素子づつ２つづつのスイッチＳＷ１ ＳＷ１０が設けられた構成となっているから、これら２つづつのスイッチの切換により１素子毎の表示書換ができる。

【図面の簡単な説明】

【図１】本発明の適用対象である電気泳動表示装置の構成を示す図。

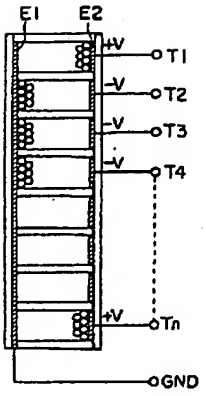
【図２】図１に示す表示装置を駆動する回路を示す図。

【図３】本発明の一実施例における回路の詳細構成を示す図。

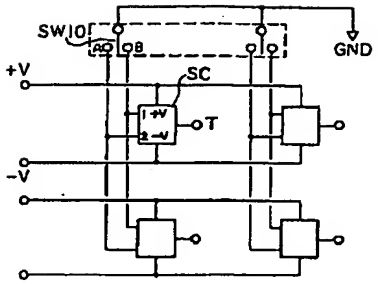
【符号の説明】

Ｄ　ダイオード
Ｅ１　全面電極
Ｅ２　分割電極
Ｑ　トランジスタ
ＳＣ　スイッチング回路
ＳＷ　スイッチ
Ｔ　端子

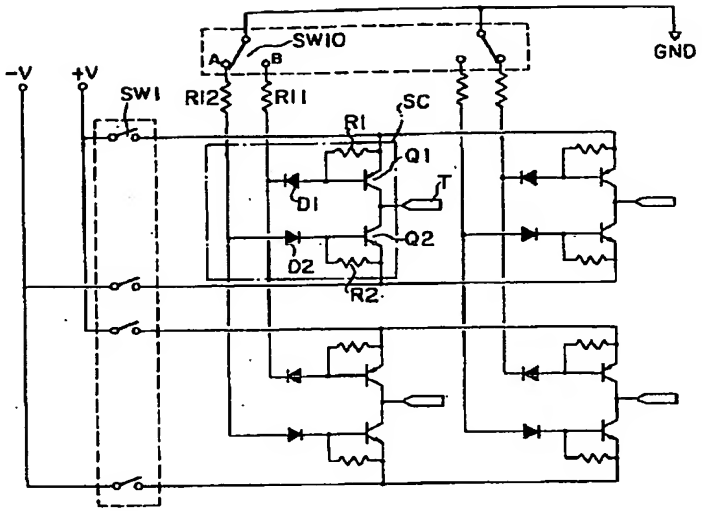
【図１】


E1
E2
+V
T1
-V
T2
-V
T3
-V
T4
+V
Tn
GND

【図２】


SW10
A
B
GND
+V
SC
1 +V
2 -V
T
-V

【図３】


SW10
A
B
GND
-V
+V
SW1
R12
R11
R1
SC
Q1
T
D1
Q2
D2
R2